to discredit the lower voltages—they are still sheet-anchors for holding fast in all lesions of the so-called radiosensitive type in the surface strata of the body. We now have a shorter wavelength of the gamma type in x-ray production, which has materially changed the aspect of radiosensitivity and radioresistance, thus broadening the field of usefulness for x-ray therapy.

Citations of case records are tiresome, more or less, but the few illustrations accompanying this article will serve to elucidate some of the points outlined in the text.

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## THE USE OF PAPAVERIN HYDROCHLORID IN MESENTERIC EMBOLISM*

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THE diagnosis of mesenteric embolism, or thrombosis, is in itself a very difficult task; this paper does not essay to cover the problem of diagnosis. Much question has been raised as to the ability of internists to correctly diagnose mesenteric arterial obstruction without abdominal exploration. More question could be raised as to their ability to treat the disease without exploration. Paradoxically, this report would tend to substantiate the internist's view that the disease might be treated medically.

### REPORTS IN THE LITERATURE

The recent widespread use of eupaverin or papaverin hydrochlorid in the treatment of pulmonary embolism has logically suggested its use in other forms of embolism. Pal,[1] in 1914, in addition to describing the anesthetic properties of papaverin, called attention to the vasodilating effect of the drug. He also concluded that in dogs it reduced the blood pressure due to its effect on the smooth muscle wall, stating that this action is "peripheral and muscular in the wider sense," being greatly exaggerated when the blood pressure was high. In some instances the depressor after-effect noted was persistent, while in other cases it was capable of only temporary reduction of the blood pressure. The axiom was that the transitory effect lies in the intensity of the type of irritant, pressure, or spasm to be overcome, and occasionally its action was powerful enough to result in circulatory stoppage with systolic standstill of the left ventricle. He looked upon the drug as a "toxin," having its influence directly upon the smooth muscle of bowel or blood vessel.

In 1933 Denk[2] recorded the successful treatment of three cases of pulmonary embolism with eupaverin. In 1934 he treated eight cases with eupaverin, only one patient recovering. Burk,[3] in 1934, reported the use of eupaverin with success. Up to the end of 1937 Denk[5] had reported the use of eupaverin in thirty-seven cases of pulmonary embolism, and had recovery in nine cases of embolism and four cases of severe pulmonary infarction.

In 1936 Allen and MacLean[4] reported the use, with some success, of papaverin in arterial occlusion of an extremity. They related the experimental work of Gossett, Bertrand, and Patel, which showed that an embolus was fixed at its point of lodgment by arterial spasm. In 1936 De Takáts[6] reported a case of pulmonary embolism and a case of acute peripheral thrombosis. He further reported three cases of pulmonary embolism, in some of which "a striking improvement of circulation resulted following the intravenous use of papaverine." Vogel,[7] in 1938, reported the successful eupaverin treatment of embolism of the external iliac artery and embolism of the pulmonary vessels, as well as pulmonary infarction. Most authors concluded that papaverin was a powerful vascular antispasmodic, which was harmless when used in recommended doses.

The best résumé of the literature thus far reported was Collins'[8] article. His use of the drug in fifteen successful cases out of seventeen reported is an excellent recommendation for its effectiveness.

While Allen,[4] in the discussion of his report of 1935, urged the use of papaverin in occlusion of the coronary, cerebral, mesenteric and pulmonary arteries, case reports of its use in mesenteric thrombosis were not available to the author. Hence, it was felt wise to record this case:

### REPORT OF CASE

The patient (S. D., Case No. 37550), male, age 52, married, gardener by occupation, presented himself at the Santa Monica Hospital on October 14, 1938, at approximately 5 p. m., with the history that at noon he had been stricken by a sudden sharp pain in the abdomen, of an intense character, radiating transversely across the middle of the abdomen at irregular intervals. At the height of the pain the patient had been forced to cry out and hold his abdomen. This had continued until 3 p. m., at which time his wife administered a dose of Epsom salts. At 5 p. m. the pain still continued at regular intervals, and the patient vomited a clear, watery material just prior to admission.

His previous history was incidental, except for multiple hernioplasties on recurrent, bilateral, inguinal hernias, without relief.

The physical examination revealed a temperature of 98 degrees; pulse 80, regular; blood pressure, systolic 110, diastolic 70; a fleshy, flushed Italian, crying with intense pain and holding his abdomen.

The findings were essentially negative, except for the abdomen, over which there was a generalized, voluntary stiffness, with no palpable masses, no definite localized areas of tenderness, but some increased rigidity noted in the left upper quadrant in the interval between the exacerbations.

Upon admission on October 14, the blood count and urinalysis were as follows: Hemoglobin, 87 per cent; erythrocytes, 5,120,000; leukocytes, 14,850; color index, .86; polymorphonuclears, 71 per cent; lymphocytes, 24 per cent; monocytes, 4 per cent; eosinophils, 1 per cent. Urinalysis: Voided specimen, transparency clear, color amber, reaction acid; specific gravity insufficient, albumin trace, sugar negative, acetone negative, diacetic acid negative, indican negative; casts rare fine and coarse granular, few hyaline, pus cells none, epithelial cells rare, no crystals, amorphous material or bacteria, and many mucous threads.

The diagnosis arrived at was acute appendicitis 75 per cent, mesenteric thrombosis 25 per cent; and immediate operation was advised.

* Read before the Section on General Surgery of the California Medical Association at the sixty-eighth annual session, Del Monte, May 1–4, 1939.

Under spinal anesthesia and through a right rectus incision, the peritoneal cavity was found filled with blood-stained, clear fluid. Investigation revealed a Meckel's diverticulum, apparently uninvolved, below which the bowel presented a normal, pinkish appearance, with pulsating arterioles. Above the Meckel's diverticulum the entire small bowel, as far proximal as the ligament of Treitz, was dark purplish blue in color, and careful investigation failed to reveal any arteriole pulsations. The mesentery was explored and revealed a mesenteric artery, which could be followed as a collapsed bloody streak to the origin of its proximal jejunal branches. Repeated aspirations in five different levels failed to obtain any flow of blood whatsoever. The conclusion was: Embolus of the superior mesenteric artery distal to the colic and iliocolic branches. The patient was given one grain of papaverin hydrochlorid and, unfortunately, the abdomen was closed without delay.

The patient returned to his room in moderate shock, with profuse diaphoresis. A Wangensteen tube was instituted and he was given fluids freely by mouth and intravenous glucose 2,000 cubic centimeters twice daily, and papaverin hydrochlorid one-half grain, subcutaneously every five hours. His temperature averaged 102 degrees the first forty-eight hours, the pulse approximately 100, respirations 22 to 24, but his pain had been successfully relieved. On the third postoperative day the patient passed gas of his own volition through the Harris flow, following which his distention became less and there was marked improvement in his general condition, but the papaverin was continued.

On the seventh postoperative day the patient had a medium, soft defecation following enema. His Wangensteen was removed. He accepted small quantities of fluids without distention or difficulty. Temperature, pulse, and respiration had returned to normal. On the tenth day he accepted a light diet, was up and about and dismissed to his home.

Follow-up blood counts were: Leukocytes 13,500 with 87 per cent polymorphonuclears, 12 per cent lymphocytes, and 1 per cent monocytes. On October 18, the hemoglobin was 85 per cent, erythrocytes 4,360,000, leukocytes 8,850, color index .89; polymorphonuclears 70 per cent, lymphocytes 25 per cent, monocytes 5 per cent. Repeated blood Wassermann tests gave a negative reaction, and electrocardiographic tracing was normal.

## COMMENT

Should opportunity be given for further observation on the use of this drug in mesenteric embolism or thrombosis, the author urges all to bear in mind these facts: (1) That the drug is harmless if correctly used; (2) that the administration should be given according to the technique of Denk, which is as follows: "Immediate slow injection of two ampoules (0.06 g) eupaverin intravenously, coramin, oxygen and, with caution, morphin. In the cases which react at all, the effect is usually evident at once or within a few minutes at the latest. Constant observation by the physician, which dare not be interrupted for even a minute, is absolutely imperative, because the eupaverin injection must be repeated with the same dose several minutes later if the effect is inadequate or if there is exacerbation of the condition. Even at night the physician must sit beside the bed, constantly controlling pulse, respiration, and general condition, and giving further injection according to necessity and without fear of overdosage if immediate aid is needed. When the situation is critical, injection should be intravenous; when there seems to be no immediate danger it should be intramuscular or subcutaneous"; (3) if condition of the patient permits, intra-abdominal observation of the effect of the drug may well be possible, since its effect, when injected intravenously, is almost momentary.

## CONCLUSION

Recent literature has focused much attention on the use of papaverin as a vasodilator, as well as a vascular antispasmodic. Its successful use is related in several cases of arterial embolism, and is described in one case of proved mesenteric embolism. Further, it is recommended that it be used in suspected mesenteric embolism since, to use the words of De Takáts,[6] "it is apparently harmless and if used early may save the patient's life."

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## REFERENCES

1. Pal, J., Das Papaverin als Gefassmittel und Anästheticum, Deutsche. med. Wchnschr. 40:164-168, Jan. 22, 1914.

2. Denk, Wolfgang, Zur Behandlung der arteriellen Embolie, München, med. Wchnschr. 81:437-439, March, 1934.

3. Burk, W., Die Lungenembolie: Ein Vorschlag zu ihrer Behandlung, Chirug. 6:91-95, Feb. 1, 1934.

4. Allen, E. V., and MacLean, A. R., Treatment of sudden arterial occlusion with papaverin hydrochlorid: report of case. Proc. Staff Meet. Mayo Clin. 10:216-220, April 3, 1935.

5. Denk, Wolfgang, Zur Behandlung der Lungenembolie, Zentralbl. f. Chir. 65:1333-35, June 11, 1938.

6. De Takáts, Géza, Use of papaverin in acute arterial occlusions, J. A. M. A. 106:1003-1005, March 21, 1936.

7. Vogel, A., Beitrag zur Behandlung der Thromboembolie mit dem Spasmolytikum Eupaverin, Fortschr. d. Therap. 14:245-247, May, 1938.

8. Collins, Donald, The value of papaverin hydrochlorid in treatment of arterial embolism, M. Rec. 148:186-190, Sept. 7, 1938.

# GRANULOMA VENEREUM INVOLVING THE RECTUM AND COLON*

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A SURVEY of the literature shows no report of a case of granuloma venereum (granuloma inguinale) involving the rectum and descending colon. In a recent review of extragenital lesions reported by Greenblatt, Torpin, and Pund,[1] two cases were made known in which the disease had involved the anus and perianal structures, but in no case had the mucosa of the higher alimentary tract been invaded. It is to be pointed out at this time that considerable confusion still exists in the literature between lymphopathia venereum (lymphogranuloma inguinale) and granuloma venereum (granuloma inguinale). While the former is caused by a filterable virus, and positive Frei tests are found in afflicted subjects, the latter is caused by a specific organism known as the "Donovan body." Involvement of the rectum, with resultant rectal stricture by lymphopathia venereum,

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1 Greenblatt, R. B., Torpin, R., and Pund, E. R.: Extragenital Granuloma Inguinale, Arch. Derm. & Syph., 38:358, 1938.